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A SUCCESSFUL COMMUNITY DRYING PLANT

C. W. PUGSLEY

Director of Agricultural Extension, University of Nebraska



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A SUCCESSFUL COMMUNITY DRYING PLANT located at Lincoln, Nebr., is described in this bulletin. Practically the same plan was followed in eleven other communities—nine of them in Nebraska—during the summer and fall of 1917, and the experience is related at this time in answer to a demand for information of this character for consideration at farmers' meetings during the winter.

The plan proved successful under conditions found in the locality of Lincoln. Much is yet to be learned concerning home, community, and commercial drying, and next season may add materially to the present rather meager but useful information.

Any person interested in the subject of community drying of fruits and vegetables will find valuable suggestions in Farmers' Bulletins 841 and 903, as well as in this publication. They may be obtained free upon application to the Division of Publications, United States Department of Agriculture.

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PRINCIPLE USED IN DRYING.

THE DRYING PLANT described in this bulletin follows closely the specifications of a community plant at Lincoln, Nebr., and 11 others in that general section, all of which were operated successfully during the summer and fall of 1917. It is an adaptation of the electric-fan process of drying. A stream of dry air is caused to flow continuously over the products being dried. The humidity of the air, the method of preparation of the vegetables, and the velocity of the air current have much to do with the rapidity of drying. It is easy to understand how this process operates, when we consider how rapidly wind

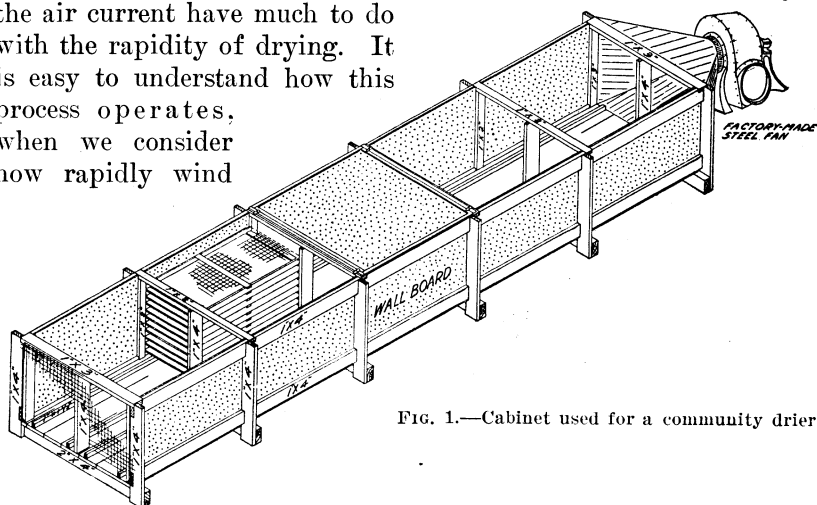


FIG. 1.—Cabinet used for a community drier.

will dry roads after a rain, or how much more rapidly clothes dry in a breeze than when the air is quiet.

Instead of the air being forced across the vegetables, as is done in some methods, the air is drawn across them. Laboratory tests indi-

cate that drying is considerably accelerated when the suction method is used, although the force method will dry satisfactorily and is used in at least one Nebraska plant.

A simple community drying plant to be of most value should be easily constructed from material ordinarily found in the community. It should be possible to operate such a plant without expert help and by power easily available. The drying plant here described can be built complete for \$250 or less. The cost usually can be reduced greatly by using material already on hand. At the time of the writing of this bulletin 12 of these plants were in successful operation.

A long cabinet is constructed as shown in figure 1. Ordinary flooring may be used to construct the bottom, and either flooring or wall board for the sides and top. For convenience the openings are placed at the top of the cabinet. The suction holds the lids firmly in place. In practice it has been found unnecessary to use lid fasteners.

The trays are stacked inside the cabinet as shown in the cut. The drier here illustrated is designed for 100 trays, there being five compartments, each con-

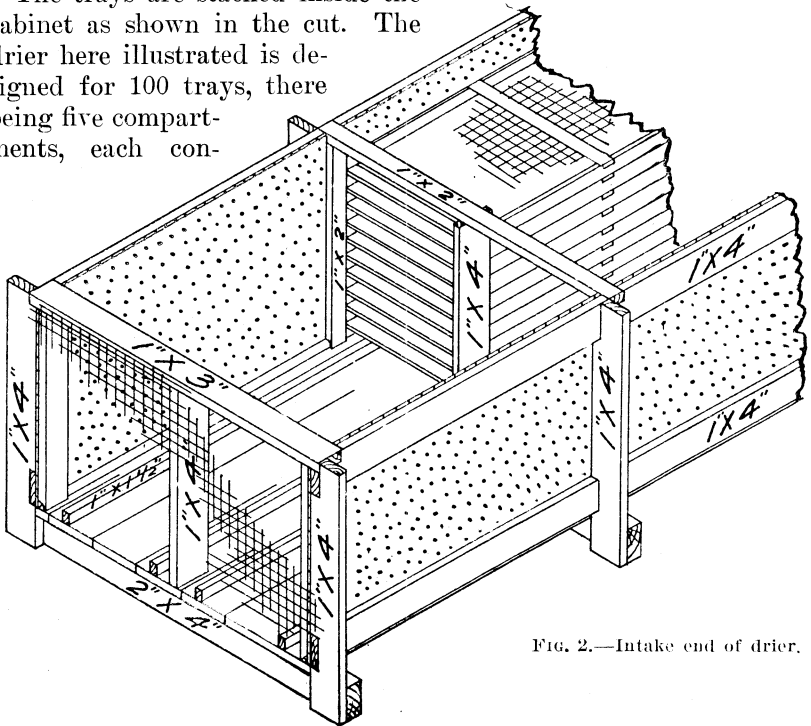


FIG. 2.—Intake end of drier.

taining 20 trays arranged in tiers of 10. Details for the construction of the cabinet are shown in a closer view of the intake end in figure 2, cross section in figure 3, and side elevation in figure 4.

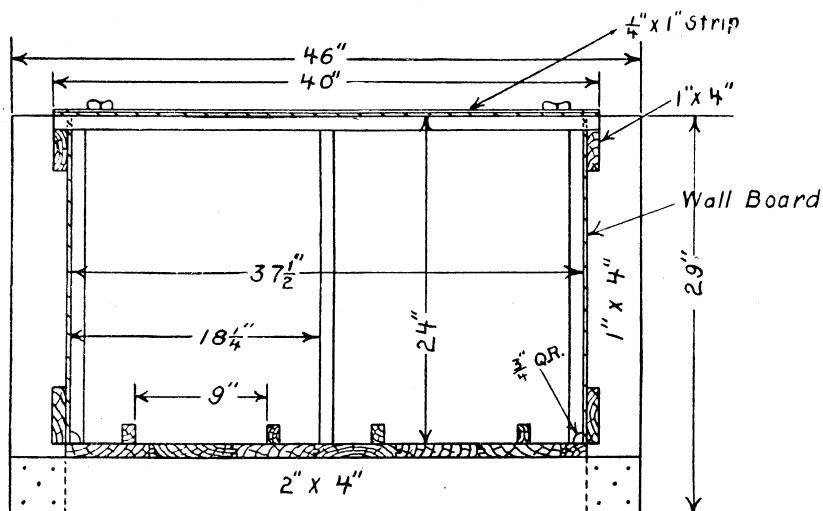


FIG. 3.—Cross section of drier.

A bill of materials for the construction of the cabinet follows:

2 pieces—2" by 4" -----12' long.	2 pieces— $\frac{1}{2}$ " by 1" -----10' long.
7 pieces—1" by 6" M. F.—18' long.	2 pieces— $\frac{1}{2}$ " by 1" -----14' long.
2 pieces—1" by 4" -----16' long.	2 pieces— $\frac{1}{4}$ " by 1" -----18' long.
4 pieces—1" by 4" -----18' long.	1 piece— $\frac{3}{4}$ " by Q. R.-----18' long.
1 piece—1" by 4" -----12' long.	1 piece—Wall board 48' by 49'.
1 piece—1" by 3" -----16' long.	Wire screen, 24' by 40', for intake end.
1 piece—1" by 2" -----16' long.	This bill for cabinet, without fan.
1 piece—1" by 2" -----14' long.	
4 pieces—1" by 1 $\frac{1}{2}$ " -----18' long.	

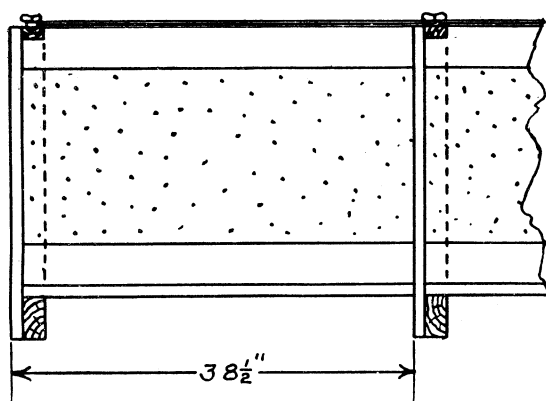


FIG. 4.—Side elevation of drier.

TRAYS FOR DRYING.

The tray 18 inches by 36 inches, shown in figure 5, has been found to be admirably adapted to community work. It holds about the quantity of material of one kind ordinarily brought by the family for drying. It is light and easily

handled, the support across the top serving as a convenient means of lifting. These trays should be made of very light material, with

wire-screen bottoms and wire screen at one end, the other end being left open. The screened end prevents light material from being drawn through, while the open end permits free access of air and ease in emptying the trays. The screened end should always be turned toward the fan when suction is used. This same type of tray is admirably adapted to the electric-fan method of home drying by stacking these trays one on the other and placing the fan at the open end of the trays.

Following is a bill of material for making 100 trays:

50 pieces— $\frac{1}{2}$ " by 2"—12' long.

38 pieces— $\frac{1}{2}$ " by $1\frac{1}{2}$ "—12' long.

50 yards wire screen, 26 inches wide.

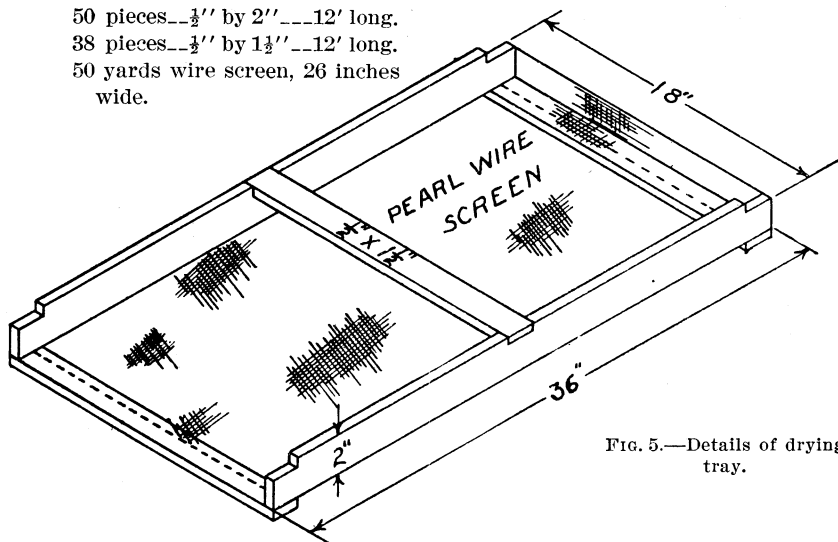


FIG. 5.—Details of drying tray.

The wire-screen trays should be paraffined to prevent the sliced fruits and vegetables from sticking. This can be done easily by warming the wire and applying melted paraffin with a brush. If any of the paraffin fills the meshes they can be opened by holding over a stove until the paraffin melts and distributes itself over the wire. The paraffin prevents all possibility of discoloration of fruits and vegetables by coming in contact with the wires.

THE FAN.

Any type of fan which moves a sufficient quantity of air can be used. Usually an old ensilage cutter blower fan or a separator fan used on a blower thrashing machine can be found in the community and adapted to the exhaust end of the cabinet. One of the Nebraska plants has been fitted with a fan which had been discarded at a planing mill, having been used there for drawing sawdust and

shavings from the planing machines. Another plant was fitted with an exhaust fan which had been used in a foundry for the removal of gases at the forges. Other plants are fitted with fans costing from \$25 to \$50. Suitable fans can be purchased from any of the fan manufacturing companies.

The main point to keep in mind in the selection of a fan is to get one that will move a sufficient quantity of air. The figures given are for a drier the size here described and give the rate of air movement when the cabinet contains no trays. Air should enter the cabinet at a rate of not less than 1,000 feet per minute, and better results will be secured if the speed is 1,250 feet per minute. This means that the fan should move air at the rate of 7,500 cubic feet per minute, which will change the air in the cabinet approximately 75 times per minute. If the fan will move air fast enough for the suction to hold a piece of cardboard or other material 1 foot square and weighing 8 ounces against the wire screen at the intake end, the drying will proceed satisfactorily.

The most important feature to watch in the construction of a drying plant of this type is the fan. It should be simple in construction, easy of operation, and, above all things, large enough to move great quantities of air. When the 100 trays are filled with fruits and vegetables it is necessary to move the air rapidly to prevent souring and molding.

THE MOTOR.

The fan may be operated by an electric motor of from 2 to 5 horsepower or by a gasoline engine of similar power. With an electric motor the only attention needed in operating is oiling the fan and occasionally the motor. A gasoline motor will require more attention in the way of oil and fuel supply, but even this is simple to operate and understood in every community.

THE USE OF HEAT IN DRYING.

Nebraska's experience with community drying indicates that ordinarily a better-colored and better-flavored product is obtained if no artificial heat is applied. Even in arid countries, however, and always in humid countries, it is best to have equipment for heating. This will be needed when the air contains much moisture, as during rainy spells. Heating the air in the room in which the drying is done will lower its humidity and facilitate the drying. If the temperature of the air is raised above 120° Fahrenheit, however, some of the dried products may be discolored or the natural flavors may

be changed. Therefore a heating device should be such that the temperature of the air will not be raised greatly. It should also be one which can be easily constructed from material found in the community.

A very effective method of heating the air is by the use of a hot-water radiator placed at the intake end of the drier, as shown in figure 6. The water in this radiator can be easily heated by means of a small hot-water heater connected as shown in figure 7.

The air is drawn through the hot-water radiator and in passing through becomes sufficiently heated to raise its temperature considerably, thus lowering the percentage of humidity.

The simplest method of raising the temperature of the air is by having the intake end of the drier in a room in which there is a stove. If this is not convenient a small room or compartment of sufficient size to contain a stove can be constructed of cheap material, such as wall board. The stove should be within a few feet of the

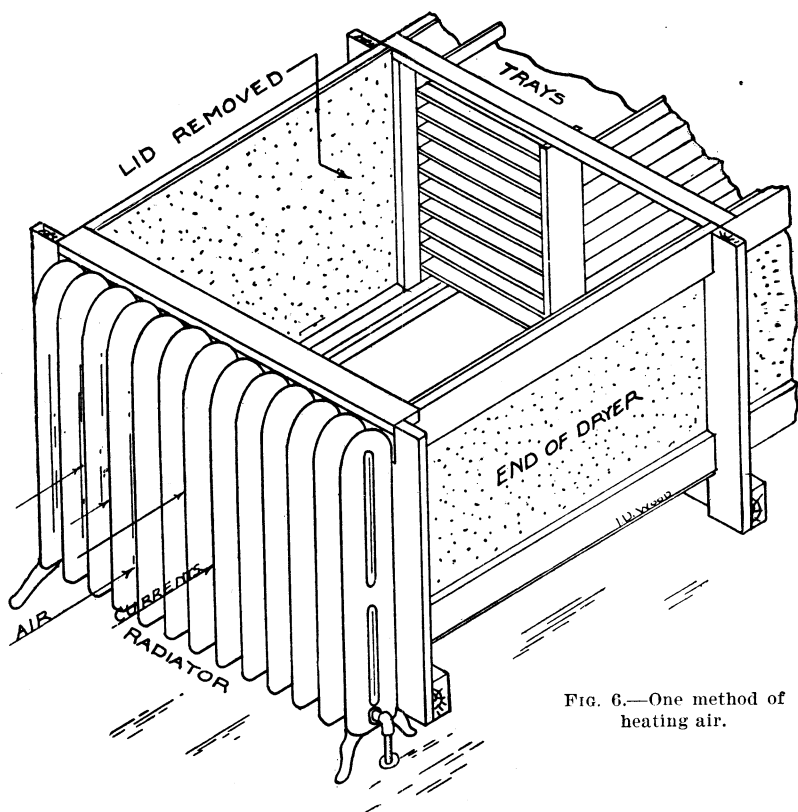


FIG. 6.—One method of heating air.

intake end. A good hot fire in the stove will do wonders in accelerating the drying on humid days. Caution should be observed to avoid fire in view of the strong draft flowing from the hot stove to the inflammable dryer.

PREPARATION OF FRUITS AND VEGETABLES.

The fruit or vegetables should be cleaned as for table use. After cleaning they should be sliced thin. The slicing process may be hastened by the use of some slicing device, such as a rotary slicer,

two types being shown in figure 8. The one in the foreground is listed at \$2 and the larger one at \$10. These slicers are similar to the bread slicers or dried-beef slicers ordinarily used.

For the satisfactory use of this method of drying it is essential to slice all material thin, so that as many of the inner cells as possible will be exposed to the action of the air current. The sliced fruits or vegetables are spread over the wire-screen trays and the trays placed in the cabinet. Figure 9 shows equal quantities of rhubarb before and after drying and indicates the method of placing on the trays.

Certain vegetables or fruits will discolor unless specially treated. Apples usually turn dark when dried. This can be prevented by dipping the sliced apples in a solution of ordinary table salt and then placing immediately on the trays for drying. This solution can be made by using $2\frac{1}{2}$ level teaspoonfuls of salt to a quart of water. Irish potatoes will discolor somewhat and can not be satisfactorily dried by this method unless they are first cooked. They can be boiled until soft, then passed through a ricer, or they can be sliced and then steamed thoroughly before placing on the trays.

In drying corn it is well to set the milk by cooking in boiling water for about 5 minutes or by cutting the corn from the cob in the raw condition and placing the corn in a slow oven and heating until the milk is set. The latter method seems to give the best-flavored and best-colored corn, but great care must be exercised not to use too much heat. Some vegetables, such as string or snap beans and shelled peas, may be blanched in live steam or boiling water for 5

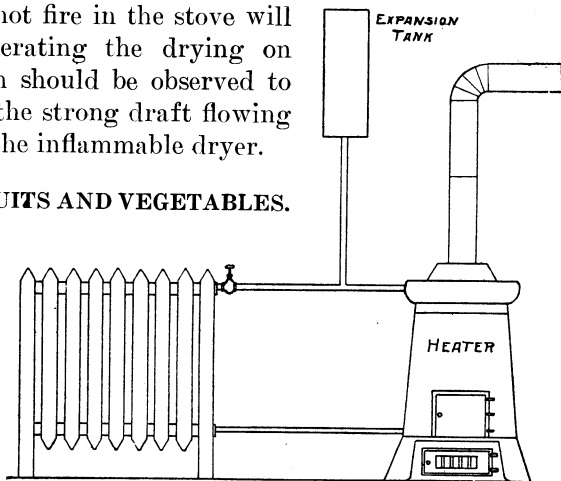


FIG. 7.—One method of heating water.

to 15 minutes, but this is not essential. Practically all fruits and vegetables, with the exceptions noted above, can be prepared in their raw state and dried satisfactorily.

STORING.

The enemies of dried fruits and vegetables are moisture, insects, and rodents, and successful storing will depend on protection against these enemies. After a sufficient amount of moisture has apparently been removed, it is well to keep the product for several days in a large container which can be protected by either a cloth cover or a wire screen. If after a few days there is any indication of moisture



FIG. 8.—Types of rotary slicers.

collecting on this dried product, it should be dried in pans in the oven or exposed to the sun or air current for a few hours and then packed in the permanent containers. Any sort of container which will prevent the product from absorbing moisture and protect it from insects and rodents will answer the purpose. Tin cans, glass jars, and, for some products, paraffin containers, pasteboard boxes, and paper sacks make good re-

ceptacles. Tin cans or glass jars can be stored with safety anywhere. If packed in paraffined containers, paper bags, or pasteboard boxes, the products should be stored in a very dry place and where rodents can not get at them.

Special precaution should be taken against the possibility of moths laying eggs on the dried products during the process of drying or before packing in the permanent containers. If these eggs are on the fruits or vegetables, they will hatch if conditions are favorable, and resulting caterpillars will render the product useless.

It is best to pack the fruit or vegetables in small containers of about the size to supply a sufficient amount for use at one or two meals. This will lessen the chance of large quantities being spoiled.

COOKING DRIED FRUITS AND VEGETABLES.

In cooking evaporated fruits or vegetables it is essential to remember that they must be soaked in cold or tepid water before they are cooked. The length of time will depend on the product. With most products, soaking overnight does no harm. If soaked overnight, they should be left in a cool place to avoid souring. The object is to get back into the cells the water which was taken out by the process of evaporation. In soaking it is well to use a sufficient amount of water to soak properly and still leave enough for cooking. Ordinarily the product should be cooked in the same water in which it is soaked, for the water will contain some of the pleasing flavors and valuable nutrients. In the case of vegetables or fruits which have a strong or bitter taste, such as turnips, a more pleasing flavor may be obtained by changing the water while cooking or soaking.

IMPORTANCE OF COMMUNITY DRIERS.

Municipal or Government-owned drying plants have been in successful operation in European countries for years. Such plants provide village communities with a convenient and simple method of drying all sorts of produce of the home garden and orchard, as well as the vegetables and fruits shipped to the community, which might be allowed to go to waste at the stores and market places. The advantage to the busy farmer's wife in the country community can not be overestimated. Her work is heaviest in the summer when vegetables and fruits must be saved for winter use. The establishment of a community drying plant at a consolidated school, country church, or centrally located farm home would offer a great relief



FIG. 9.—Trays of fresh and dried rhubarb.

from her heavy kitchen duties. The housewife could clean and slice at least a portion of the fruits and vegetables she desires to conserve, and either take these or have one of the children take them to the community drying plant, where they could be left until it was convenient to call for the dried product.

OPERATION OF COMMUNITY DRIERS.

Municipalities might well establish plants from municipal funds, the work being supervised by the city council or other town authorities. If the plant is not a municipal plant it is best to place it under the guidance of some association already in existence, such as a civic improvement club, commercial club, or home-school garden club, or by a special community club organized for the purpose.

In one community where a drying plant is established, a special community club of approximately 60 families has been organized, primarily to look after the operation of the drying plant. The officers, consisting of president, vice president, secretary, and treasurer, constitute the executive committee, and are entrusted with power to act. A simple form of constitution and by-laws was adopted, and meetings of the club are held monthly or oftener, usually at the drying plant, which in this community is in a room of a church building.

Whether the plant is operated by a municipality or by a community club, it is necessary to have a caretaker who will be at the plant during certain hours of the day to receive and deliver fruit and vegetables, to keep the plant in proper condition, and to keep the fan and motor running. Usually it is best to have the plant open to the public from two to four hours a day, say, from 10 to 12 o'clock in the mornings and from 4 to 6 o'clock in the afternoons. The caretaker should live near the plant. In case a community plant is established in a country district it would be well to have the plant located at the home of the caretaker.

The caretakers may be paid by the hour for their services, and the money may be obtained by making a charge of from two to five cents a tray for the privilege of drying. Unless the motor power is supplied by the municipality, club, or some public-spirited individual, it is necessary to make this charge sufficiently large to cover the cost of operating the motor.¹

¹ The following bulletins will be sent free on application to the Division of Publications, United States Department of Agriculture, Washington, D. C.:

Home Canning by the One-Period Cold-Pack Method. Farmers' Bulletin 839.

Drying Fruits and Vegetables in the Home. Farmers' Bulletin 841.

Home Canning of Fruits and Vegetables. Farmers' Bulletin 853.

Other bulletins on canning and drying can be obtained by writing to the State Agricultural Colleges.